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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

ZERVIGON, R

ART UNIT

PAPER NUMBER

1763

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office copy

Office Action Summary

Application No.
08/905,971

Applicant(s)
Kazayuki et al

Examiner
Rudy Zervigon

Group Art Unit
1763



☐ Responsive to communication(s) filed on _____

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-26 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-26 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☒ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). 2,5

☐ Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-4, 9, 14, 15, 16, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) in view of Mikio Takagi (Pub. No. 2-152251). Tepman et al describe *a substrate processing apparatus (item 20, Figure 1)* where component chambers are each *hermetically* configured (column 1, lines 59-63) and exhibit the following attributes:

- i. *a substrate transfer section* embodied by Tepman et al here as item 24, Figure 1 (column 4, line 40)
- ii. *a plurality of detachably attached modules* embodied here by Tepman et al as *processing chambers for processing substrates* (items 34, Figure 1; column 4, lines 3-9) and *a plurality of modules* embodied by Tepman et al as *first and second intermediate processing or treatment chambers* (items 26, 27, and 28 Figure 1) *for processing substrates*. The implication that Tepman et al provides *a plurality of detachably attached modules* embodied here by Tepman et al as processing chambers (items 34, Figure 1; column 4, lines 3-7) is supported by the selection of a monolithic design for the main housing (item 22, Figure 1; column 4,

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lines 30-37). If item 22 is monolithic then processing chambers (items 34, Figure 1) must therefore be *a plurality of detachably attached modules*.

- iii. *first substrate transfer means* embodied by Tepman et al as item 40 of Figure 1 (column 4, lines 39-46) provided in
- iv. *a substrate transfer section* (item 24, Figure 1) *capable of transferring a substrate to the plurality of modules*
- v. *a first valve* (items 38, figure 1) *capable of establishing hermetic* (column 1, lines 59-63) *isolation between the processing chambers for processing substrates* (items 34, Figure 1; column 4, lines 3-9) and *a plurality of modules* embodied by Tepman et al as *first and second intermediate processing or treatment chambers* (items 26, 27, and 28 Figure 1) *when the first valve is closed and allowing a substrate to pass through when opened* (column 4, lines 7-9)
- vi. *a second valve* (items 38, figure 1) *capable of establishing hermetic* (column 1, lines 59-63) *isolation between the first and second intermediate processing or treatment chambers* (items 26, 27, and 28 Figure 1) and *a substrate transfer section* embodied by Tepman et al here as item 24, Figure 1 (column 4, line 40) *when the second valve is closed and allowing a substrate to pass through when opened* (column 4, lines 7-9)
- vii. *a third valve* (items 38, figure 1) *capable of establishing hermetic* (column 1, lines 59-63) *isolation between the first and second intermediate processing or treatment chambers* (items 26, 27, and 28 Figure 1) and *a substrate transfer section* embodied by Tepman et al

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here as item 24, Figure 1 (column 4, line 40) *when the third valve is closed and allowing a substrate to pass through when opened (column 4, lines 7-9)*

- viii. *first and second intermediate processing or treatment chambers additionally are provided with second substrate transfer means (item 42, Figure 1; column 4, lines 47-48) capable of transferring a substrate to a processing or treatment chamber.*
- ix. *all component chambers are each hermetically configured (column 1, lines 59-63) and can be independently reduced in pressure (column 4, line 63 - column 5 line 5). Motivation for such design is additionally provided (column 5, lines 5-14).*
- x. *an intermediate chamber (item 24, Figure 1) supporting substrate holding means (item 40, Figure 1) positioned closer to the substrate transfer section (items 21, Figure 1) than the second substrate transfer means (item 42, Figure 1, 2, 3a, 3b, 4a, 4b)*

Tepman et al does not expressly describe processing a plurality of substrates. Nor does Tepman et al expressly describe *modules piled up separately in a substantially vertical direction*.

Mikio Takagi describes a manufacturing system of vertical-type semiconductor (title, JPO abstract). Specifically, Mikio Takagi describes "...a process chamber installed in each stage position of a space positioned in an up-and-down direction..." in order to "...reduce a floor area and to easily install more systems...". Thus the Mikio Takagi reference supports *a substrate processing apparatus hermetically configured exhibiting modules piled up separately in a substantially vertical direction*. Mikio Takagi

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additionally describes all component chambers each *hermetically* configured and can be *independently reduced in pressure* (abstract, "Individual process chambers are evacuated in advance to a prescribed pressure by using individual pumps 3"). Mikio Takagi additionally provides for an elevator capable of vertically moving a first substrate transfer means (items 11, 14; constitution).

It is the examiner's position that a person of ordinary skill in the art, at the time the invention was made, would have found it obvious to modify the Tepman et al *substrate processing apparatus* by implementing the Mikio Takagi *substrate processing apparatus hermetically* configured exhibiting *modules piled up separately in a substantially vertical direction*. Motivation for such design alteration of the Tepman et al *substrate processing apparatus* is provided by Mikio Takagi. Specifically, "To reduce a floor area and to easily install more systems (...*modules being detachable attached...*)" which is centered on reducing the clean room foot print in order to reduce operating costs. Hence, impetus is economical.

3. Claims 5,6,17,18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) as applied to claims 1-4 above, and further in view of Hideki Lee (U.S. Pat. 5,616,208). Tepman et al do not describe processing *substrates under atmospheric pressure* through a *substrate transfer section*. Hideki Lee describes a vacuum processing apparatus including

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a plurality of vacuum processing chambers (column 9, lines 19-34). Specifically, Hideki Lee describes processing *substrates* serially and *under atmospheric pressure* (column 10, lines 32-42) through a *substrate transfer section* (items 20, 21, Figure 8). Additionally, Hideki Lee, as well as Tepman et al (column 5, lines 1-14), describes processing substrates in a *substrate processing chamber* (items 1, 2, and 3, Figure 8) *under reduced pressure* (column 9, line 24).

It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious to modify the Tepman et al multichamber processing apparatus whereby substrates are transferred through a *substrate transfer section* (items 20, 21, Figure 8) while sustaining atmospheric pressure as is taught by Hideki Lee. Motivation for processing substrates that are transferred through a *substrate transfer section* (items 20, 21, Figure 8) while sustaining atmospheric pressure during the transfer is centered on selecting where, in the processing of the substrate, the reactant gas will be introduced. Such selection is within the independent pressuee control as exhibited by the references and encompassed within the level of ordinary skill in view of the cited references.

4. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) as applied to claims 1-4 above, and further in view of Sato Junichi (Pub. No. 04240721). Tepman et al does not describe *cassette holding means accommodating a plurality of substrates where the first substrate transfer means is capable of transferring a substrate between the cassette and plurality of modules*. According to the JPO abstract, Sato Junichi describes *cassette holding means (item 21) accommodating a plurality of substrates (items A) where the first substrate*

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transfer means (discussed in constitution) is capable of transferring a substrate between the cassette and plurality of modules (items 26,27,29, and 31).

It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious, in view of Sato Junichi, to modify the Tepman et al apparatus by introducing Sato Junichi 's *cassette holding means accommodating a plurality of substrates where the first substrate transfer means is capable of transferring a substrate between the cassette and plurality of modules*. Motivation for enhancing the Tepman et al apparatus with Sato Junichi's *cassette holding means accommodating a plurality of substrates where the first substrate transfer means is capable of transferring a substrate between the cassette and plurality of modules* is drawn from the economic advantage of a higher throughput of wafer substrates.

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) as applied to claim 7 above, and further in view of Shunpei Yamazaki (U.S. Pat. 4,582,720). Tepman et al and Sato Junichi do not describe a *first substrate transfer means structure capable of transferring* a wafer cassette. Accordingly, Shunpei Yamazaki provides for *first substrate transfer means structure capable of transferring* a wafer cassette (column 4, lines 48-68; column 5, lines 5-17).

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It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious, in view of Sato Junichi and Shunpei Yamazaki, to modify the Tepman et al apparatus by introducing Shunpei Yamazaki's *first substrate transfer means structure capable of transferring* a wafer cassette (column 4, lines 48-68; column 5, lines 5-17). Motivation for enhancing the Tepman et al apparatus with Shunpei Yamazaki's *first substrate transfer means structure capable of transferring* a wafer cassette (column 4, lines 48-68; column 5, lines 5-17) is drawn from the economic advantage of a higher throughput of wafer substrates.

6. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) as applied to claim 9 above, and further in view of Shunpei Yamazaki (U.S. Pat. 4,582,720). Tepman et al and Mikio Takagi do not specifically describe a *cassette introduction section whose height is different from the height of the cassette holding means*. Nor do Tepman et al and Mikio Takagi describe *processing a plurality of substrates simultaneously*. Accordingly, Shunpei Yamazaki provides a *cassette introduction section* (item A, Figure 1) whose *height is different from the height of the cassette holding means* (item 70, Figure 1). Additionally, Shunpei Yamazaki describe *processing a plurality of substrates simultaneously laterally arranged side by side* (column 4, lines 63-68; column 5, lines 5-17).

It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious, in view of Mikio Takagi and Shunpei Yamazaki, to modify the

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Tepman et al apparatus by introducing Shunpei Yamazaki's *cassette introduction section* (item A, Figure 1) whose *height is different from the height of the cassette holding means* (item 70, Figure 1) and by providing means for *processing a plurality of substrates simultaneously*. Motivation for enhancing the Tepman et al apparatus with Shunpei Yamazaki's *cassette introduction section* (item A, Figure 1) whose *height is different from the height of the cassette holding means* (item 70, Figure 1) is drawn from the desire for Shunpei Yamazaki's *cassette introduction section* (item A, Figure 1) to fit the *cassette holding means* (item 70, Figure 1) when introduced from an exterior position relative to chamber A. Additional motivation for Shunpei Yamazaki's means for *processing a plurality of substrates simultaneously* is drawn from the motivation presented in the rejection of claim 8.

7. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) as applied to claims 1-4, 9, 14, 15, 16 above, and further in view of Shunpei Yamazaki (U.S. Pat. 4,582,720). Tepman et al describe an *intermediate chamber* (item 24, Figure 1) supporting *substrate holding means* (item 40, Figure 1) positioned closer to the *substrate transfer section* (items 21, Figure 1) than the *second substrate transfer means* (item 42, Figure 1, 2, 3a, 3b, 4a, 4b). However, Tepman et al does not specifically describe an *intermediate chamber* supporting heat-resistant *substrate holding means* positioned closer to the *substrate transfer section* than the *second substrate transfer means*. Because the Tepman et al apparatus plasma processes the substrate in later chambers (items 34, Figure 1), this may imply that there is no

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heat resistance imparted to the *intermediate chamber substrate holding means*. The structural characteristics of Shunpei Yamazaki's plasma assisted chemical vapor deposition apparatus (column 2, lines 13-21) is in many respects identical to the presently claimed apparatus. The primary difference between the presently claimed invention at that of Shunpei Yamazaki's plasma assisted chemical vapor deposition apparatus is the orientation of the device itself. The presently claimed invention has its long axis (processing direction vector) parallel to the gravity vector while the long axis (processing direction vector) of the Shunpei Yamazaki apparatus is perpendicular to the gravity vector. Specifically, Shunpei Yamazaki describes *a substrate transfer section (item A, Figure 1), an intermediate chamber (item B, Figure 1), and a final processing chamber (item C, Figure 1)*. *An intermediate chamber (item B, Figure 1), supports heat-resistant substrate holding means (item 70, Figure 1) used in the intermediate processing chamber under a heated plasma process (column 5, lines 17-25; lines 55-59).*

It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious to enhance the Tepman et al *intermediate chamber (item 24, Figure 1) supporting substrate holding means (item 40, Figure 1) positioned closer to the substrate transfer section (items 21, Figure 1) than the second substrate transfer means (item 42, Figure 1, 2, 3a, 3b, 4a, 4b)* by employing heat-resistance as taught by Shunpei Yamazaki's plasma assisted chemical vapor deposition apparatus. Motivation for employing heat resistance to the

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substrate holding means (item 40, Figure 1) is drawn from the fact that plasma generating apparatus commonly operate at elevated temperatures.

8. Claims 20,21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al as applied to claims 1-4, 9, 14, 15, 16 above, and further in view of Shunpei Yamazaki. Tepman et al and Mikio Takagi do not describe a *first substrate transfer means structure capable of transferring* a wafer cassette. Accordingly, Shunpei Yamazaki provides for *first substrate transfer means structure capable of transferring* a wafer cassette (column 4, lines 48-68; column 5, lines 5-17) to a *plurality of modules* (items A,B,C, Figure 1). Additionally, Shunpei Yamazaki describes *first substrate transfer means structure (carrier rod) provided with a structure capable of transferring* a wafer cassette (column 5, lines 8-11).

It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious, in view of Mikio Takagi and Shunpei Yamazaki, to modify the Tepman et al apparatus by introducing Shunpei Yamazaki's *first substrate transfer means structure capable of transferring* a wafer cassette (column 4, lines 48-68; column 5, lines 5-17). Motivation for enhancing the Tepman et al apparatus with Shunpei Yamazaki's *first substrate transfer means structure capable of transferring* a wafer cassette (column 4, lines 48-68; column 5, lines 5-17) is drawn from the economic advantage of a higher throughput of wafer substrates.

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9. Claim rejected under 35 U.S.C. 103(a) as being unpatentable over as applied to claim above, and further in view of .

10. Claims 23, 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tepman et al (U.S. Pat. 5,186,718) as applied to claims 1-4, 9, 14, 15, 16, 22 above, and further in view of Shunpei Yamazaki (U.S. Pat. 4,582,720). Tepman et al and Mikio Takagi do not specifically describe *a cassette introduction section whose height is different from the height of the cassette holding means*. Nor do Tepman et al and Mikio Takagi describe *processing a plurality of substrates simultaneously*. Accordingly, Shunpei Yamazaki provides a *cassette introduction section* (item A, Figure 1) whose *height is different from the height of the cassette holding means* (item 70, Figure 1). Additionally, Shunpei Yamazaki describe *processing a plurality of substrates simultaneously laterally arranged side by side* (column 4, lines 63-68; column 5, lines 5-17) in a *plasma* assisted chemical vapor deposition apparatus (column 2, lines 13-21).

It is the examiner's position that a person of ordinary skill in the art at the time the invention was made would have found it obvious, in view of Mikio Takagi and Shunpei Yamazaki, to modify the Tepman et al apparatus by introducing Shunpei Yamazaki's *cassette introduction section* (item A, Figure 1) whose *height is different from the height of the cassette holding means* (item 70, Figure 1) and by providing means for *processing a plurality of substrates simultaneously*. Motivation for enhancing the Tepman et al apparatus with Shunpei Yamazaki's *cassette introduction section* (item A, Figure 1) whose *height is different from the height of the cassette holding means* (item 70,

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Figure 1) is drawn from the desire for Shunpei Yamazaki's *cassette introduction section* (item A, Figure 1) to fit the *cassette holding means* (item 70, Figure 1) when introduced from an exterior position relative to chamber A. Additional motivation for Shunpei Yamazaki's means for *processing a plurality of substrates simultaneously* is drawn from the motivation presented in the rejection of claim 8.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. No.:

4,666,734

5,773,088

4,405,435

4,717,461


12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (703) 305-1351. The examiner can normally be reached on a Monday through Friday schedule from 8am until 5pm. The official AF fax phone number for the 1763 art unit is (703) 305-3599. Any Inquiry of a general nature

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or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (703) 308-0661.



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Rudy Zervigon - RZ

June 27, 1999